Strategies to improve the quality of oral health care for frail and dependent older people

J G Steele, A W G Walls

Abstract

The dental profile of the population of most industrialised countries is changing. For the first time in at least a century most elderly people in the United Kingdom will soon have some of their own natural teeth. This could be beneficial for the frail and dependent elderly, as natural teeth are associated with greater dietary freedom of choice and good nutrition. There may also be problems including high levels of dental disease associated with poor hygiene and diet. New data from a national oral health survey in Great Britain is presented. The few dentate elderly people in institutions at the moment have poor hygiene and high levels of dental decay. If these problems persist as dentate younger generations get older, the burden of care will be substantial. Many dental problems in elderly people are preventable or would benefit from early intervention. Strategies to approach these problems are presented.

(*Quality in Health Care* 1997;6:165–169)

Keywords: dental care; elderly

Introduction

Concerns over the quality of oral health care for frail or dependent elderly people are not something to which industrialised societies have traditionally been very accustomed. For as long as institutionalised care of the very old has been a feature of our way of life, being elderly has been associated with being toothless. Historically, the dental care required by most of this population amounted to no more than occasional replacement of complete dentures. Disease associated with the soft tissues occurred but, with the exception of oral cancer, did not require complex treatment. For most of the population the options were limited, the costs low, and the results predictable, although not always ideal. The people who retained natural teeth into advanced age were sufficiently few to be manageable within existing frameworks of care, and oral health tended to be low on a list of priorities for health care in elderly people.

However, the need for oral health care in dependent elderly people will soon be a much bigger issue. The key to this is the profound alteration in the dental state of the population, a change which has been shown clearly in Britain and which is being mirrored throughout much of the developed world.[1] Retention of some natural teeth into old age was a rarity until recently. In 1968, 88% of the over 75 year olds in England and Wales had no natural teeth,[2] many having been rendered edentulous before the second world war. Since the war, the younger groups in the population have retained their natural teeth much longer; this is at least partly due to the increased availability of affordable dental care combined with an increasing desire to retain natural teeth. The first wave of this group of dentate people reached adulthood during the second world war and have now been of pensionable age for some time. We are just starting to see the first major changes in the dental status of the oldest members of the United Kingdom population, although some other countries are further down this line.[1] Predictions from data recorded in 1968, 1978, and 1988 in the United Kingdom suggest that there will be at least a threefold increase in the proportion of the 75 and over age group who have teeth (from 20% up to 68%) over the 30 year period from 1988 to 2018. This is predicted to increase further to 81% over the subsequent 20 years.[3]

With planning and awareness, the widespread retention of natural teeth among frail and dependent elderly people could bring considerable benefits in terms of health and wellbeing. There is good evidence to show that, when sufficient teeth are retained in a reasonable condition, dietary intake is improved and general health, wellbeing, and satisfaction with oral function tend to be higher than in the edentulous and those with a very limited natural dentition.[4–7] However, the improvements in oral health which have led to the retention of teeth into old age also have the potential to bring with them a new set of problems which need to be solved.

There is a substantial and growing body of evidence to link advanced periodontal disease and oral sepsis associated with remaining natural teeth to serious problems with general health. There is evidence suggesting fairly strong specific associations between coronary heart disease and perhaps also stroke, and dental disease.[8–10] Poor dental state (specifically poor hygiene) has also been associated with fatal chest infection in frail dependent elderly people.[11] Although the evidence for all of these associations is, as yet, inconclusive, it is growing and looks increasingly convincing.

Natural teeth in the future generations of very old people will often be there only by virtue of a lifetime of repeated restorative treatment, such as fillings, root fillings and crowns. Even with no further disease, the maintenance of existing restorations will be a substantial undertaking. However, there are additional concerns about the susceptibility of elderly people to forms of disease which

Department of Restorative Dentistry, Dental School, Framlington Place, Newcastle upon Tyne NE2 4BW
J G Steele, lecturer in restorative dentistry
A W G Walls, professor in restorative dentistry

Correspondence to:
Professor A W G Walls, Department of Restorative Dentistry, Dental School, Framlington Place, Newcastle upon Tyne NE2 4BW, UK.

Accepted for publication 30 June 1997

Table 1 Percentage dentate in the United Kingdom national diet and nutrition survey (NDNS) of adults aged ≥65

Sample group	Weighted base	With natural teeth (%)
Institution	274	21
Free living:		
All ages	879	51
65–74 y	534	60
75–84 y	278	40
≥85 y	69	23

predominantly affect older people. Foremost among these is decay of the roots of the teeth, a form of dental caries which is of little relevance to younger people, but as gums recede roots susceptible to decay are exposed. This becomes much more prevalent in elderly people. In very old people additional factors, related to use of medication and dietary changes, increase the risk of root caries substantially.[12–14]

Although many of the common conditions affecting natural teeth are difficult to treat in very old and frail subjects, they may be easier to prevent. Control of diet and good hygiene combined with early detection and simple preventive treatment of early disease may be sufficient to prevent or slow down root decay and good hygiene is essential to the control of periodontal disease,[15 16] but these measures need strategic planning both at an individual and a population level. If there is no strategic awareness and no implementation of effective prevention, the result will be discomfort and cost to these subjects, logistic problems for carers who have to organise treatment, and an economic burden for the rest of society.

The oral health of frail and dependent elderly people: is there a problem?

The evidence we have on the oral health of this group is limited, but what there is suggests that oral health is poor. Historically, many of the studies were of those with no natural teeth, as there were few elderly people in institutions with natural teeth. These indicated that the quality of dentures and of oral hygiene were not good.[17 18] Limited data for dentate people suggest similar problems of poor hygiene and disease,[19–23] and this seems to be an international phenomenon.

Some of the more recent data for frail and dependent elderly people come from the oral health survey which was part of the recent national diet and nutrition survey (NDNS) conducted in Britain in 1994–5.[24 25] This survey was commissioned by the Departments of Health in England, Wales, and Scotland and the Ministry of Agriculture, Fisheries, and Food. Although detailed data are awaiting publication, the tables summarise some of the key findings and give a good indication of the oral health of people in institutions in Great Britain. The participants in the oral health survey included a nationally representative random sample of people aged 65 and over living in residential institutions. There was also a larger sample of free living people aged 65 years and over. The samples are weighted to reflect the national population living in institutions, and the free living population aged 65 or over respectively. The two samples (free living and in an institution) should not be compared directly as they are not matched for age and sex, both of which are related to oral status; however, even taking into account the differences in the make up of the samples, a number of trends are evident.

Table 1 indicates very clearly how close we are to having the first generation of dentate very old people (aged 85 or over) in the United Kingdom. The age related trend in the percentage of dentate people which is shown does not indicate that teeth are lost rapidly with age. National data have been followed up since 1968 and the apparent steep increase in the percentage with natural teeth with reducing age group represents a cohort effect reflecting historic and current patterns of care. This increase in the proportion of the population with natural teeth represents the leading edge of a tidal wave of natural teeth which has now reached the 75–84 year age band. The dentate proportion in the institution sample (21%) is similar to the 85 and over age group of free living people(23%).

Table 2 shows that although there are many dentate older adults, most have a very reduced dentition. More than 20 teeth is often used as a threshold for a dentition which is functional without the need for partial dentures. Even among the people with natural teeth, the percentage with 21 or more is small, even in the younger group (65–74) it is 32%. Many of the rest of those with teeth will rely upon a denture combined with their natural teeth to give them a functioning dentition. Table 2 also shows clearly that there is a higher rate of tooth decay (including root caries) in frail and dependent elderly people living in institutions than among free living people. Nearly a third of all natural teeth are affected, compared with just over 10% of all teeth in free living people aged 65 and over. The number of free living very old people (≥85) with some teeth is still low, hence the final base number for this group is small, particularly after weighting. However, the data presented indicate that there is also a higher level of decay in this group than in younger groups, but less than that found for the sample from institutions.

Table 3 gives the data for root decay, and once again indicates the considerable difference between the institutional and the free living samples, with the institutional group having more than twice the number of decayed or unsound root surfaces than the free living, despite there being far fewer vulnerable teeth.

Table 2 Percentage of the dentate participants with a functional dentition of 21 or more teeth

		Free living		
	Institution	Total	65–74	≥75 (≥85)
Base (unweighted)	57	405	220	185 (43)
Base (weighted)	55	451	323	128 (16)
Functional dentition (%)	16	26	32	22 (5)
Mean number teeth	10.7	15.5	16.1	13.9 (10.1)
Decayed or unsound teeth (mean number)	3.3	1.7	1.7	1.9 (2.5)
Decayed or unsound teeth (%)	31	11	11	14 (25)

Table 3 Mean number of teeth vulnerable to root decay, mean number of roots with decay, and the mean root caries index (RCI) for dentate participants in the NDNS (adults aged ≥65) oral health survey

		Free living		
	Institution	Total	65–74	≥75 (≥85)
Base (unweighted)	57	405	220	185 (43)
Base (weighted)	55	451	323	128 (16)
Mean number of vulnerable roots	9.3	13.3	13.7	12.4 (9.6)
Mean number of unsound roots	2.7	1.3	1.2	1.4 (2.1)
Mean RCI (%)	46	26	25	30 (38)

NDNS= national diet and nutrition survey.

Table 4 Percentage of dentate participants and percentage of teeth with some moderately severe accumulations of plaque

		Free living		
	Institution	Total	65–74	≥75 (≥85)
Base (unweighted)	41	329	185	140 (32)
Base (weighted)	39	369	279	95 (12)
Large accumulations of plaque (% dentate participants)	77	50	51	49 (58)
Teeth affected (%)	32	15	15	14 (32)

The root caries index (RCI) gives an indication of the past and current root surface decay taking into account vulnerable teeth,[26] and is higher (46%) in the institutional group than in the free living group(26%).

The differences in periodontal disease between the institutional group and the free living group were small, but the differences in plaque accumulations were not (table 4). Over three quarters of frail and dependent elderly people in institutions had some teeth with grade 3 plaque, representing a very poor level of oral hygiene with plaque covering much of the surface of the tooth and largely blocking out the spaces between adjacent teeth. Almost everybody (96%) had some teeth with grade 2 plaque, which is still a very large visible deposit. Perhaps of most concern was that nearly a third of all teeth in the institutional group had gross (grade 3) deposits. It is very likely that the large plaque deposits are closely related to the high levels of decay.

The poor hygiene and the tooth decay prevalent in elderly people living in institutions are a concern. Tooth decay may seem to be trivial by comparison with some of the general health problems faced by frail and dependent elderly people. This is not the case when it results in toothache or needs to be treated in such a person in their home. Also, the negative impact of poor oral health on general health and wellbeing, and the positive impact (in terms of diet, nutrition, and self image) resulting from good oral health, should not be underestimated.

Strategies for oral health in frail and dependent elderly people

As the numbers of dentate elderly people begin to rise rapidly we are in a situation which we think is finely balanced between the widespread retention of natural teeth being a benefit, and their disease and management being a burden. The evidence from existing data on elderly people in institutions indicates that the balance could easily tip towards being a burden unless oral health care is improved. The awareness of these problems among health professionals and carers, and their ability to implement appropriate but low cost management strategies, will be critical if quality of care is to be improved and the balance tipped towards benefit.

Appropriate oral health management strategies in the frail and dependent elderly population will be about control of disease rather than complex and complete treatment. The two factors which could make the greatest difference between oral health benefit and oral health burden are good oral hygiene and care with diet. Dental professionals have a part to play, but the day to day management of these factors is largely out of their control and in many cases will also be out of the control of the patient. Lack of motivation is often a substantial barrier to improving oral hygiene and diet, but dependent elderly people are in an unusual position in that the motivation which is required is on the part of the carers rather than the elderly people themselves. This may make the universal delivery of good hygiene and diet easier for this age group than we might expect.

Improving hygiene

Dental plaque is an accumulation of oral bacteria in a sticky organic matrix which adheres to teeth and any other hard surfaces in the mouth, including dentures. It is present in every mouth and when it is removed will reappear in clinically detectable quantities within a few hours. Dental plaque has fundamental associations with both of the main dental diseases (periodontal disease and dental caries, including root caries), but is easily removed from most sites by simple but appropriate brushing. Effective plaque control is of fundamental importance in controlling periodontal disease.[16] Where areas of root surfaces are exposed to the oral environment, as is the case in elderly people, good plaque control should play an equally important part in controlling root caries.[26–29] The key to ensuring that retained natural teeth are a benefit to frail and dependent elderly people is avoidance of uncontrolled tooth loss and pain resulting from these diseases; good quality plaque control would go a very long way towards achieving this.

There is nothing very complicated about plaque removal, if it is done effectively there is theoretically no need to do it more than once or twice a day. Yet, plaque scores among elderly people in institutions in the recent national diet and nutrition survey of people aged 65 years and over were much higher than among the free living people, and root caries scores were correspondingly high, although there was little difference in periodontal measurements. Dependent elderly people are often not in a position to maintain the levels of oral hygiene required, and many may never have had good oral hygiene. The burden of responsibility for this very simple but important function will fall upon those who care for them, but a knowledge of effective but simple oral hygiene practices is

not inherent, it needs to be delivered, and brushing somebody else's teeth is a skill that has to be learned.

The first part of a strategy for improving the oral health care of frail and dependent elderly people is to consider the issue of education of carers both in relation to the need for and the provision of health care and monitoring. Such training could be achieved at a relatively low cost with use of dental hygienists and dental health educators.

Dietary awareness

Dental caries occurs when plaque bacteria metabolise dietary sugars to produce acids on the surface of the tooth. The resultant low pH leads to demineralisation of the mineral component and subsequent softening and cavitation of the tooth surface. The pH gradually recovers after the sugar intake, but frequent sugar intakes maintain a constantly low pH and persistent damaging caries activity. When saliva flow is reduced the recovery of pH after a sugar intake is further delayed, allowing more time for demineralisation to occur. When the pH recovers remineralisation and repair of damaged surfaces may occur when there is sufficient salivary flow.

Anybody who has frequent intake of foods containing sugar is at risk of ongoing caries activity.[30] Dependent and frail elderly people are at additional risk because salivary flow is often reduced substantially by use of medication or other systemic factors, whereas there are usually many exposed root surfaces which are vulnerable sites for new caries.[28 29] Plaque control will provide some protection, but even when this is good there are areas which cannot be easily cleaned. A reduction in the intake of non-milk extrinsic sugars, particularly in the frequency of intake is at the heart of caries control. The worst imaginable dietary regime, from the point of view of dental decay, would be frequent intake of sugar—for example, in the form of sweetened tea or coffee or as snacks such as biscuits and confectionery that contain sugar. Regrettably this (empirically) seems to be a perfect description of dietary practice which is common in many residential institutions. Ironically, many elderly people may be able to manage a more challenging (in terms of chewing) and less cariogenic diet if natural teeth are retained in good condition.

The second part of our strategy for improving oral health in frail and dependent elderly people is to put into place advisory and monitoring structures to ensure good dietary practice in these groups. Once again the dental professional can only provide an advisory role, the real difference could be made by those who administer the day to day care of these elderly subjects.

Professional monitoring and treatment

Even where appropriate preventive strategies are in place, disease will still occur and dental decay can often progress rapidly in elderly people. Early detection will often lead to simple treatment which can be delivered quickly in the home. Early detection means frequent checks by trained professionals. Ideally this would be a dentist, but need not necessarily be so. Auxiliary dental personnel could fulfill the monitoring role, and visiting medical professionals may also be in a position to detect problems early, although a dentist would normally be required to provide any treatment. Once again, planning and awareness are required. By the time dental problems have become symptomatic, their management is usually complex, uncomfortable, and in the case of frail and dependent elderly people, inconvenient and costly.

Another strategy for effective and high quality oral health care for frail and dependent elderly people is frequent monitoring of their oral state to ensure prompt detection and treatment of dental disease.

Additional preventive measures

A range of additional agents are available which may make an important contribution to preventing dental disease in dependent elderly people. Fluorides, self administered in the form of mouthwashes, or professionally administered in the form of varnishes or other topical applications can make a substantial difference to the control of caries, even in older adults.[31] There is evidence to show that fluoridation of the water supply also results in a significant reduction in root surface caries in older adults.[32–35] Chlorhexidine mouthwashes are very effective in plaque control and may prove a useful adjunct to conventional oral hygiene practices.[36] Other promising topical chlorhexidine applications are also now available and may provide considerable benefit in terms of preventing dental decay.[15] All of these will be useful, but (with the exception of fluoridation of the water supply) should be used only on the basis of professional dental advice.

Conclusions

Within a few years there will be a rapid and profound alteration in the oral health of the oldest members of society. The change will be towards the retention of natural teeth. This could bring important benefits in terms of nutrition and general wellbeing, but it could also bring with it a great deal of dental disease and the need for complex care. Management strategies based on prevention, frequent monitoring, and early treatment of dental disease are essential if the full benefit of improvements in oral health are to be forthcoming.

We thank the project board of the national diet and nutrition survey of people aged 65 years and over for their permission to use some of the data contained within this paper. The national diet and nutrition survey of people aged 65 years and over was funded jointly by the Ministry of Agriculture, Fisheries, and Food and the Department of Health and conducted by Social and Community Planning Research in conjunction with the Dunn nutrition unit and the University of Newcastle, University College London, and the University of Birmingham. Oral health survey grant number MTN12.

1 Ettinger RL. Demography and dental needs, an international perspective. *Gerodontology* 1993;10:3–9.
2 Gray PG, Todd JE, Slack GL, Bulman JS. *Adult dental health in England and Wales in 1968*. London: HMSO, 1970.
3 Todd JE, Lader D. *Adult dental health 1988: United Kingdom*. London: HMSO, 1991.

4 Chauncey HH, Muench ME, Kapur KK, Wayler AH. The effect of the loss of teeth on diet and nutrition. *Int Dent J* 1984;**34**:98–104.
5 Osterberg T, Steen B. Relationship between dental state and dietary intake in 70 year old males and females in Gothenburg, Sweden: a population study. *J Oral Rehabil* 1982;**9**: 509–21.
6 Osterberg T, Mellstrom D, Sundh V. Dental Health and functional ageing. *Community Dentistry and Oral Epidemiology* 1990;**18**:313–8.
7 Steele JG, Ayatollahi SMT, Walls AWG, Murray JJ. Clinical factors related to reported satisfaction with oral function in dentate older adults in England. *Community Dentistry and Oral Epidemiology* 1997;**25**:143–149.
8 DeStefano F, Anda RF, Kahn HS, Williamson DF, Russell CM. Dental disease and risk of coronary heart disease. *BMJ* 1993;**306**:688–91.
9 Beck K, Garcia J, Heiss G, Volionas P, Offenbacher S. Periodontal disease and cardiovascular disease. *J Periodontol 1996*;**67**:1123–37.
10 Syrjanen J, Peltola J, Valtonen V. Dental Infections in association with cerebral infarction in young and middle-aged men. *J Intern Med.*1989;**225**:179–84.
11 Scannapieco FA, Mylotte JM. Relationship between periodontal disease and bacterial pneumonia. *J Periodontol* 1996;**13**:118–29.
12 Galan D, Lynch E. Epidemiology of root caries. *Gerodontology* 1993;**10**:59–71
13 Vehkalati MM, Rajula M, Tuominen R, Puinio IK. Prevalence of root caries in the adult Finnish Population. *Community Dentistry and Oral Epidemiology* 1983;**11**:188–90.
14 Joshi A, Papas AS, Giunta root caries incidence and associated risk factors in middle aged and older adults. *Gerodontology* 1993;**10**:83–9
15 Lynch E. Antimicrobial management of primary root caries lesions: a review. *Gerodontology* 1996;**13**:118–29.
16 Jenkins WMM. The prevention and control of chronic periodontal disease. In: Murray JJ, ed. *Prevention of oral disease.* 3rd ed. Oxford: Oxford University Press, 1996:118–38.
17 Ekelund R. The dental and oral condition and the need for treatment among the residents of municipal old peoples homes in Finland. *Proc Finn Dent Soc* 1984;**80**:43–52.
18 Tobias B, Smith JM. Barriers to dental care and associated oral status and treatment needs in an elderly population living in sheltered accommodation in West Essex. *Br Dent J* 1987;**163**:293–5.
19 Stuck AE, Chapuis C, Fluiy H, Lang NP. Dental treatment needs in an elderly population referred to a geriatric hospital in Switzerland. *Community Dentistry and Oral Epidemiology* 1989;**17**:267–272.
20 Jokstad A, Ambjornsen E, Eide KE. Oral health in institutionalized elderly people. *Acta Odontol Scand* 1996; **54**:303–308.
21 Vigild M. Denture status and the realistic need for prosthodontic treatment among institutionalized elderly in Denmark. *Community Dentistry and Oral Epidemiology* 1987;**15**: 128 -133.
22 Vigild M. Dental caries and the need for treatment among institutionalised elderly. *Community Dentistry and Oral Epidemiology* 1989;**17**:102–5.
23 Vigild M. Oral hygiene and periodontal conditions among 201 institutionalized elderly. *Gerodontics* 1988;**4**:140–5.
24 Finch S, Doyle W, Lowe C, Bates CJ, Prentice A, Smithers G, Clarke PC. *National diet and nutrition survey: people aged 65 years or over. Vol 1: report of the diet and nutrition survey.* London: Stationary Office, 1997 (in press).
25 Steele JG, Shieham A, Marcenes W, Walls AWG. *National diet and nutrition survey: people aged 65-years or over. Vol 2: report of the oral health survey.* London: Stationary Office, 1997 (in press).
26 Katz RV. Assessing root caries in populations: the evolution of the root caries index. *J Public Health Dent* 1980;**40**:7–16.
27 Ravald N, Birkhead D, Hamp SE, Root caries susceptibility in periodontally treated patients. Results after 12 years. *J Clin Periodontol* 1993;**13**:758–67.
28 Budtz-Jorgensen E, Mojon P, Rentsch A, Roehrich N, von der Muehll D, Baehni P. Caries prevalence and associated predisposing conditions in recently hospitalized elderly persons. *Acta Odontol Scand* 1996;**54**:251–6.
29 Hix JO, O'Leary TJ. The relationship between cemental caries, oral hygiene status and fermentable carbohydrate intake. J *Periodontol* 1976;**47**:394–404.
30 Rugg-Gunn AJ. Diet and dental caries. In: Murray JJ, ed. *Prevention of oral disease*, 3rd ed. Oxford: Oxford University Press, 1996:3–31.
31 Jones JA. Root caries prevention and chemotherapy. *Am J Dent* 1995;**8**:353–7.
32 Stamm JW, Banting DW. Comparison of root caries prevalence in adults with life-long residence in fluoridated and non-fluoridated communities. *J Dent Res* 1980; **59**(suppl):405.
33 Brustman BA. Impact of exposure to fluoride adequate water on root surface caries in the elderly. *Gerodontics* 1986;**2**:203–7.
34 Hunt RJ, Eldredge JB, Beck JD. Effect of residence in a fluoridated community on the incidence of coronal and root caries in an older population. *J Public Health Dent* 1989;**49**:138–141
35 Whelton HP, Holland TJ, O'Mullane DM. The prevalence of root surface caries amongst Irish adults *Gerodontology* 1993;**10**:72–5.
36 Addy M, Moran J, Wade W. Chemical plaque control in the prevention of gingivitis and periodontitis. In: Lang NP, Karring T, eds. *Proceedings of the 1st European workshop on periodontology* (Ittingen 1993). London: Quintessence, 1994:244–57.